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EXAMINER	
CHANG, AUDREY Y	
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2872	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/842,935	Applicant(s) KOZHUKH, MICHAEL	
	Examiner Audrey Y. Chang	Art Unit 2872	

-- The MAILING DATE of this communication appears on the cover sh t with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 08 January 2003.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-6,8-13 and 16-30 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6,8-13 and 16-30 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Remark

- This Office Action is in response to applicant's appeal brief filed on January 8, 2003, which has been entered as paper number 9.
- Claims 1-6, 8-13 and 16-30 remain pending in this application.
- The rejections to claims 1-6, 8-13, 22 and 29 under 35 USC 112, second paragraph, set forth in the previous Office Action are withdrawn.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 16-21 are rejected under 35 U.S.C. 102(b) as being anticipated by the patent issued to Li et al (PN. 5,619,059).**

Li et al teaches a *color deformable mirror device* (10) having a plurality of electronically controlled *micro-mirrors* that each is comprised of a *mirror element* (16, Figure 1) with a color mirror (34). The color mirror (34) is comprised of a mirror *substrate* (22), which can be made of *semiconductor material such as silicon*, (please see column 6, lines 41-43), and *an optical thin film interference color coating* (24) formed on top of the mirror substrate, wherein a high reflectance *silver layer* (26) is ***directly*** formed on top of the silicon mirror substrate as shown in Figure 1, (please see column 6, lines 44-50).

With regard to claim 17, Li et al teaches that the color mirrors (34) in the deformable mirror device (DMD) are *micro-mirrors* that each can be switched on or off by driving electronics, (please see Figures 1-2).

With regard to claims 18-21, Li et al teaches that the *optical thin film* interference *color coating layer* (24), serves as the *absorbing layer*, has multilayer structure such that it includes absorbing layers (30 and 32) and transparent layer (28) that can be formed by layer materials such as *silicon dioxide* and *silicon nitride* dielectric materials, (please see column 6, lines 55-58). The absorbing layers are formed over the silver layer such that the color coating layer may be red, blue or green color coating wherein it implicitly absorbs blue light, (please see Figures 1 and 2, columns 5-6). The method of forming the color deformable mirror device is in implicitly included.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 1-6, 8-10, and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al in view of the "Thin Film Optical Filter" by Macleod, McGraw Hill, 1986, pages 95-100.**

Li et al teaches a *color deformable mirror device* (10) having a plurality of electronically controlled *micro-mirrors* that each is comprised of a *mirror element* (16, Figure 1) with a color mirror (34). The color mirror (34) is comprised of a mirror *substrate* (22), which can be made of semiconductor material such as silicon, (please see column 6, lines 41-43), and *an optical thin film interference color coating* (24) formed on top of the mirror substrate, wherein a high reflectance silver layer (26) is ***directly*** formed on top of the silicon mirror substrate as shown in Figure 1, (please see column 6, lines 44-50).

Li et al further teaches that the optical thin film interference *color coating layer* (24), serves as the *absorbing layer*, has multilayer structure such that it includes absorbing layers (30 and 32) and

transparent layer (28) that can be formed by layer materials such as *silicon dioxide* and *silicon nitride* dielectric materials, (please see column 6, lines 55-58). The absorbing layers are formed over the silver layer such that the color coating layer may be red, blue or green color coating where it implicitly absorbs blue light, (please see Figures 1 and 2, columns 5-6). The method of forming the color deformable mirror device is in implicitly included.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the layer thickness for the layer components in the color-coating layer is between 700 to 750 Angstroms. However since Li et al teaches specifically that the color coating layer is designed to reflect red, *blue* and green colors respectively, the limitations concern the layer thickness are therefore either *inherently* met by the disclosure of the coating or an *obvious modifications* to one skilled in the art since it is well known in the art that layer thickness is an essential factor for designing and adjusting the reflectance/transmittance spectrum of the multilayer interference coating. Furthermore, it is common knowledge to one skilled in the art that the interference color coating can assume *quarter wavelength stack structure* wherein each layer has an optical thickness of a quarter of the design wavelength, as demonstrated by the teachings of Macleod, (please see page 95). Macleod further teaches that the layer thickness may be modified from the value of quarter wavelength by choosing the desired refractive indices according to the relationship shown in Figure 3.19. The optical thickness is defined as the actual thickness of the layer times the index refraction of the layer material. In this case, the index refraction for silicon dioxide is 1.5 and the index refraction for silicon nitride is 2.0. According to the general knowledge in the art as demonstrated by the teachings of Macleod in order for the coating of Li et al to be able to absorb blue light, the optical thickness of layers of the interference coating have to assume values about a quarter wavelength of the blue light (wavelength of 4550 to 4920 Angstrom) which means the thickness of the layers has to be about 700 to 750 Angstrom in order for the phase difference between the reflected blue light from the two layers to be out of phase, (i.e. achieving destructive interference).

With regard to claims 12 and 13, Li et al teaches that the color-coating layer are formed by using *chemical vapor deposition process* (CVD) but it does not teach explicitly about the temperature used, (please see column 9). However this feature has to be either implicitly included or an obvious modification to one skilled in the art since the temperature setting is an essential and standard factor for carrying out the CVD process and it would be common knowledge to one skilled in the art to use proper temperature setting for forming the color coating.

5. **Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al in view of the "Thin Film Optical Filter" by Macleod, McGraw Hill, 1986, pages 95-100 as applied to claim 8 above, and further in view of the patent issued to Jerman et al.**

The color deformable mirror device taught by Li et al in combination with the teachings of Macleod as described for claim 8 above have met all the limitations of the claim with the exception that it does not teach explicitly that the reflective silver layer is deposited at 50 ^{0}C. Jerman et al in the same field of endeavor teaches a micro-mirror having silver layer deposited on silicon wafer wherein the silver layer is deposited at room temperature (which is generally understood to be between 20 to 25 ^{0}C) in order to minimize their residual internal stress, (please see column 17, lines 6-8). It would then have been obvious to one skilled in the art to apply the teachings of Jerman et al to form the silver layer at room temperature for the benefit stated above.

6. **Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al in view of "Thin Film Optical Filter" by Macleod, McGraw Hill, 1986, pages 95-100.**

The deformable mirror device taught by Li et al as described for claim 16 above has met all the limitations of the claims. These references do not teach explicitly that the layer thickness for the layer components in the color-coating layer is of the claimed values. However since Li et al teaches

specifically that the color coating layer is designed to reflect red, *blue* and green colors respectively, the limitations concern the layer thickness are therefore either *inherently* met by the disclosure of the coating or an *obvious modifications* to one skilled in the art since it is well known in the art that layer thickness is an essential factor for designing and adjusting the reflectance/transmittance spectrum of the multilayer interference coating. Furthermore, it is common knowledge to one skilled in the art that the interference color coating can assume *quarter wavelength stack structure* wherein each layer has an optical thickness of a quarter of the design wavelength, as demonstrated by the teachings of Macleod, (please see page 95). Macleod further teaches that the layer thickness may be modified from the value of quarter wavelength by choosing the desired refractive indices according to the relationship shown in Figure 3.19. The optical thickness is defined as the actual thickness of the layer times the index refraction of the layer material. In this case, the index refraction for silicon dioxide is 1.5 and the index refraction for silicon nitride is 2.0. According to the general knowledge in the art as demonstrated by the teachings of Macleod in order for the coating of Li et al to be able to absorb blue light, the optical thickness of layers of the interference coating have to assume values about a quarter wavelength of the blue light (wavelength of 4550 to 4920 Angstrom) which means the thickness of the layers has to be about 700 to 750 Angstrom in order for the phase difference between the reflected blue light from the two layers to be out of phase, (i.e. achieving destructive interference).

7. **Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al in view of the patent issued to Jerman et al.**

The color deformable mirror device taught by Li et al as described for claim 16 above has met all the limitations of the claim with the exception that it does not teach explicitly that the silver layer is formed at a temperature below 50. **Jerman** et al in the same field of endeavor teaches an optical data storage system having a *plurality of micro-mirrors* (103) that each having a *silicon wafer* (691, Figure

10), serves as the *substrate* and a *reflective metal layer* such as *silver layer* (692) formed on the silicon substrate, wherein the silver metal layer is deposited at *room temperature* which is generally understood to be between 20 to 25 ^{0}C, to minimize the internal residual stress, (please see columns 17, lines 5-8). It would then have been obvious to one skilled in the art to apply the teachings of Jerman et al to form the silver layer in such manner at room temperature to minimize internal residual stress.

8. **Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al.**

The deformable mirror device taught by Li et al as described for claim 16 above has met all the limitations of the claim. Li et al also teaches that the color-coating layer is formed by using *chemical vapor deposition process* (CVD) but it does not teach explicitly about the temperature used, (please see column 9). However this feature has to be either implicitly included or an obvious modification to one skilled in the art since the temperature setting is an essential factor and standard factor for carrying out the CVD process and it would be common knowledge to one skilled in the art to use proper temperature setting for forming the color coating.

9. **Claims 25-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the paten issued to Li et al in view of the patent issued to Jerman et al.**

Li et al teaches a *color deformable mirror device* (10) having a plurality of electronically controlled *micro-mirrors* that each is comprised of a *mirror element* (16, Figure 1) with a color mirror (34). The color mirror (34) is comprised of a mirror *substrate* (22), which can be made of semiconductor material such as silicon, (please see column 6, lines 41-43), and *an optical thin film interference color coating* (24) formed on top of the mirror substrate, wherein a high reflectance silver layer (26) is ***directly*** formed on top of the silicon mirror substrate as shown in Figure 1, (please see column 6, lines 44-50).

Li et al teaches that the optical thin film interference *color coating layer* (24), serves as the *absorbing layer*, has multilayer structure such it includes absorbing layers (30 and 32) and transparent layer (28) that can be formed by layer materials such as *silicon dioxide* and *silicon nitride* dielectric materials, (please see column 6, lines 55-58). The absorbing layers are formed over the silver layer such that the color coating layer may be red, blue or green color coating where it implicitly absorbs blue light, (please see Figures 1 and 2, columns 5-6). The method of forming the color deformable mirror device is in implicitly included.

This reference has met all the limitations of the claim with the exception that it does not teaches explicitly that the silver layer is formed at temperature below 50 degree Celsius. Jerman et al in the same field of endeavor teaches to form the silver layer at room temperature for the benefit of minimizing the residual internal stress, (please see column 17, lines 5-8). It would have been obvious to ones killed in the art to adopt such depositing process for the benefit stated above.

With regard to claim 27, Li et al teaches that the color coating layer are formed by using *chemical vapor deposition process* (CVD) but it does not teach explicitly about the temperature used, (please see column 9). However this feature has to be either implicitly included or an obvious modification to one skilled in the art since the temperature setting is an essential factor for carrying out the CVD process and it would be common knowledge to one skilled in the art to use proper temperature setting for forming the color coating.

10. **Claims 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Li et al and Jerman et al as applied to claim 25 above, and further in view of the "Thin Film Optical Filter" by Macleod, McGraw Hill, 1986, pages 95-100.**

The deformable mirror taught by Li et al in combination with the teachings of Jerman as described for claim 25 above have met all the limitations of the claims. Theses references however do not

teach explicitly that the layer thickness for the layer components in the color-coating layer is of the claimed values. However since Li et al teaches specifically that the color coating layer is designed to reflect red, *blue* and green colors respectively, the limitations concern the layer thickness are therefore either *inherently* met by the disclosure of the coating or an *obvious modifications* to one skilled in the art since it is well known in the art that layer thickness is an essential factor for designing and adjusting the reflectance/transmittance spectrum of the multilayer interference coating. Furthermore, it is common knowledge to one skilled in the art that the interference color coating can assume *quarter wavelength stack structure* wherein each layer has an optical thickness of a quarter of the design wavelength, as demonstrated by the teachings of Macleod, (please see page 95). Macleod further teaches that the layer thickness may be modified from the value of quarter wavelength by choosing the desired refractive indices according to the relationship shown in Figure 3.19. The optical thickness is defined as the actual thickness of the layer times the index refraction of the layer material. In this case, the index refraction for silicon dioxide is 1.5 and the index refraction for silicon nitride is 2.0. According to the general knowledge in the art as demonstrated by the teachings of Macleod, in order for the coating of Li et al to be able to absorb *blue* light, the optical thickness of layers of the interference coating have to assume the values *about* a quarter wavelength of the blue light (wavelength of 4550 to 4920 Angstrom) which means the thickness of the layers has to be about 700 to 750 Angstrom in order for the phase difference between the reflected blue light from the two layers to be out of phase, (i.e. achieving destructive interference).

With regard to claim 30, Li et al teaches that the color-coating layer is formed by using *chemical vapor deposition process* (CVD).

Response to Arguments

11. Applicant's arguments with respect to claims 1-6, 8-13, and 16-30 have been considered but are moot in view of the new ground(s) of rejection.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 703-305-6208. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on 703-308-1637. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Audrey Y. Chang
Primary Examiner
Art Unit 2872

A. Chang, Ph.D.
March 26, 2003

Cassandra Spyrou
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